APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/546,392	04/10/2000	Atsushi Watanabe	392.1681/JDH	2369

			EXAMINER
21171	7590	03/25/2004	HESSELTINE, RYAN J

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ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

		Application No.		Applicant(s)	
Office Action Summary		09/546,392		WATANABE ET AL.	
		Examiner		Art Unit	
		Ryan J Hesseltine		2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>14 January 2004</u>.

2a)☐ This action is **FINAL**.　　　　2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-32</u> is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-32</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>05 December 2003</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☒ All　b)☐ Some * c)☐ None of:

　　　　1.☒ Certified copies of the priority documents have been received.

　　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set forth in

37 CFR 1.17(e), was filed in this application after final rejection. Since this application is

eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e)

has been timely paid, the finality of the previous Office action has been withdrawn pursuant to

37 CFR 1.114. Applicant's submission filed on January 14, 2004 has been entered.

Response to Arguments

2.   Applicant's arguments on pages 10 and 11, filed December 5, 2003, with respect to the

restriction requirement have been fully considered and are persuasive. The restriction of claims

23-26 has been withdrawn.

3.   Applicant's arguments on page 11, last two paragraphs, with respect to the drawings have

been fully considered and are persuasive. The objection to Figures 6 and 9 has been withdrawn.

4.   Applicant's arguments on page 12, first paragraph, filed December 5, 2003, with respect

to claims 8-10 and 19-21 have been fully considered and are persuasive. The 35 U.S.C. 112, 2nd

paragraph rejection of claims 8-10 and 19-21 has been withdrawn.

5.   Applicant's arguments on page 13, first paragraph, with respect to claims 1 and 12 have

been fully considered but they are not persuasive. On page 13, line 3-5, applicant states, "neither

reference [Suzuki or Kelley] discusses or suggests using predetermined workpiece-robot

arrangement information (reference models) to orient the robot for the purpose of acquiring or

preparing to acquire the workpiece." In response to applicant's argument that the references fail

to show certain features of applicant's invention, it is noted that the features upon which

applicant relies (i.e., "using predetermined workpiece-robot arrangement information to orient

the robot") are not recited in the rejected claim(s). Although the claims are interpreted in light of

the specification, limitations from the specification are not read into the claims. See *In re Van*

Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

6.   Applicant's arguments on page 14, third paragraph, with respect to the combination of

Kelley with Suzuki have been fully considered but they are not persuasive. The teaching in

Kelley to use reference model matching to acquire a workpiece from randomly arranged

workpieces is not based on the fact that Suzuki's disclosed method is based on workpieces laid

flat and arriving one at a time on a conveyor belt. In response to applicant's argument that the

"rejection's proposed motive to combine Kelley with Suzuki is incorrect," the test for

obviousness is not whether the features of a secondary reference may be bodily incorporated into

the structure of the primary reference; nor is it that the claimed invention must be expressly

suggested in any one or all of the references. Rather, the test is what the combined teachings of

the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642

F.2d 413, 208 USPQ 871 (CCPA 1981). In response to applicant's arguments against the

references individually, one cannot show nonobviousness by attacking references individually

where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413,

208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir.

1986).

7.   In light of the above responses to applicant's arguments, applicant's arguments with

respect to claims 1 and 12 have been considered but are moot in view of the new ground(s) of

rejection.

Claim Rejections - 35 USC § 112

8.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the
> subject matter which the applicant regards as his invention.

9.   Claim 26 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for

failing to particularly point out and distinctly claim the subject matter which applicant regards as

the invention.

10.   Claim 26 recites the limitation "the arm" in line 2. There is insufficient antecedent basis

for this limitation in the claim.

Claim Rejections - 35 USC § 103

11.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

12.   Claims 1-4, 12-15, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Iida et al. (USPN 5,446,835, newly cited, "Iida") in view of Fallon (USPN 4,985,846,

newly cited).

13.   Regarding claim 1, Iida discloses a robot system having an image processing function for

determining orientation, or orientation and position of a robot operation on an object of detection

among a plurality of objects (column 3, line 50-55), the system comprising: a robot (30); a first

image capturing device (camera 10); a memory (23) storing reference (collative) models, each

created based on an image of a reference object (work W) captured by said image capturing

device in a different direction (basic positions, Figure 4), and for each reference model storing

information of the capturing direction of its associated image and information of an orientation

of the robot (hand information) with respect to the reference object, said reference object (work)

being one of the plurality of objects or having a shape substantially identical to one of the

plurality of objects (Figure 2; column 4, line 28-40); and a processor (CPU 21) to perform

matching (collation) processing on the reference (collative) model images (column 4, line 1-16)

and a working image (video signal) of the plurality of objects (captured by said first image

capturing device) to select an image of one of the reference models that matches the object of

detection in the working image (column 4, line 41-59), and to determine the orientation, or the

orientation and position (directional central coordinate position with a direction) of the robot

operation to be performed on the object of detection (column 5, line 20-28), the determining

based on the selected image of the reference object, based on said one reference (collative)

model and the information of its associated capturing direction, and based on the information of

the orientation of the robot with respect to the reference object that is associated with said one

reference model (column 5, line 50-57; column 6, line 22-30).

14.   Iida discloses that reference (collative) models are set in advance on the basis of the data

specifying a configuration when a plurality of specific portions of a work W take basic positions

(column 4, line 28-34), but does not disclose that each reference model is comprised of an image

of a reference object. Fallon discloses an acoustical/optical bin picking system wherein a

controller is taught the particular shape of a part and the location and identification of a

predetermined feature on the part by recording an image of the part in digital memory (column 4,

line 35-42). It would have been obvious to one of ordinary skill in the art at the time the

invention was made to store a reference model, each comprising an image of a reference object

as taught by Fallon in order to compare a video image of a tentatively identified part to the stored image in order to locate a predetermined feature on the part used to generate a bearing to identify and locate the part to be picked up (column 2, line 4-18).

15.   Regarding claim 12, a robot system having an image processing function for determining orientation, or orientation and position of a robot operation on an object of detection among a plurality of objects of plural kinds (column 6, line 51-55), the system comprising: a robot (30); a first image capturing device (camera 10); a memory (23) storing reference (collative) models, each comprising images (see above discussion of claim 1 with respect to Fallon) of each of different kinds of reference objects (column 6, line 51-64; column 10, line 21-31) captured by said image capturing device, and storing indicia (marks) of the kinds respectively associated with said reference models (column 15, line 9-28, line 42-47), and information of a different orientation (hand information) of the robot with respect to each of the different images of the reference object of each kind, each of said reference objects being one of the kinds of the plurality of objects or having a shape substantially identical thereto (Figure 2; column 4, line 28-40); and a processor (CPU 21) to perform matching (collation) processing on the reference (collative) model images (column 4, line 1-16) and a working image (video signal) of the plurality of objects of plural kinds (captured by said first image capturing device) to select an image of one of said kinds of the reference models that matches the object of detection in the working image (column 4, line 41-59), and to determine the orientation, or the orientation and position (directional central coordinate position with a direction) of the robot operation to be performed on the object of detection (column 5, line 20-28), the determining based on the selected image based on said one reference (collative) model, based on the indicia (marks) of the

kind associated with said one reference model and the information of the orientation of the robot

with respect to the reference object associated with said one reference model of said one kind

(column 5, line 50-57; column 6, line 22-30).

16.   Regarding claims 2 and 13, Fallon discloses that said reference models are obtained from

a part of the image data of the reference object (column 4, line 37-42).

17.   Regarding claims 3 and 14, Fallon discloses that said reference models are obtained by

processing the image data of the reference object (column 4, line 37-42).

18.   Regarding claims 4 and 15, Iida discloses that said first image capturing device comprises

a camera (10) for capturing two-dimensional image data (column 3, line 50-55).

19.   Regarding claim 23, Iida discloses a method for automatically determining an

arrangement of a workpiece relative to a robot (column 3, line 50-55), the method comprising:

storing reference (collative model) images (see above discussion of claim 1 with respect to

Fallon) of the workpiece or an object so shaped (workpiece/object) and reference arrangement

information indicating arrangements (basic positions) of the robot and workpiece/object relative

to each other when the images were captured (column 4, line 28-40); from a known arrangement

of the robot, capturing a working image of the workpiece among a plurality of randomly

arranged workpieces with an imaging device (column 4, line 41-46); finding one of the reference

images that has a closest match (collation) to the workpiece in the working image (column 5, line

6-22); and determining a known arrangement of the robot relative to the workpiece (directional

central coordinate position with a direction) based on information indicating the known

arrangement of the robot, and based on the reference (collative model) arrangement information

corresponding to the found reference image (column 5, line 20-28; column 6, line 22-30).

20.   Regarding claim 24, Iida discloses that reference images and reference arrangement
information is obtained for workpieces/objects of different shapes (column 6, line 51-55), and
wherein the finding comprises first determining that a reference image of one of the different
shapes matches the working image of the workpiece, and then finding one reference image of the
shape that best matches the working image (column 6, line 55-64; column 10, line 21-31).

21.   Regarding claim 25, Fallon discloses that the robot is used to capture the reference
images, and wherein the reference arrangement information represents arrangements of the robot
when capturing the reference images (column 4, line 35-42).

22.   Claims 5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iida in
view of Fallon as applied to claims 4 and 15 above, and further in view of Suyama et al. (USPN
4,879,664, previously cited, "Suyama") or Stauffer (USPN 4,410,804, previously cited).

23.   Iida does not disclose that the image data are captured from a predetermined distance.
Suyama discloses a three-dimensional position sensor comprising robot-teaching apparatus
wherein said image data of the reference object are captured by said camera (figure 11a, element
35) from a predetermined distance (column 6, line 20-37). In addition, Stauffer teaches that if a
two-dimensional sensor is used, the image processor is unable to simultaneously determine the
distance to the object unless the objects are always positioned at a known distance (column 1,
line 31-39). It would have been obvious to one of ordinary skill in the art at the time the
invention was made to capture an image at a predetermined distance in order to calibrate a three-
dimensional sensor as taught by Suyama or such that the distance to the object need not be
determined by other means as taught by Stauffer.

24.   Claims 6, 7, 11, 17, 18, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Iida in view of Fallon as applied to claims 1 and 12 above, and further in view of Maeno et

al. (USPN 5,047,714, previously cited, "Maeno").

25.   Regarding claims 6 and 17, Iida does not disclose that the robot moves a second image

capture device to have the determined orientation and/or position. Maeno discloses a method of

recognizing surface-mounted parts including a robot system comprising a second image

capturing device (figure 7c, element 10); wherein said robot situates said second image data

capturing device to have said determined orientation or to have said determined orientation and

said determined position with respect to the object (column 4, line 47-49), and said processor

processes second image data captured by said second image capturing device to detect position

and/or posture of the object with respect to said second image data capturing device (column 4,

line 54-63). It would have been obvious to one of ordinary skill in the art at the time the

invention was made to move the second image capture device (imaging tube) to have the

determined orientation and/or position as taught by Maeno in order to locate position detecting

patterns located at specific positions to accurately and directly determine the position and

direction of conductor patterns on the printed circuit board (column 1, line 51-59).

26.   Regarding claims 7 and 18, Iida discloses determining the three-dimensional position

(directional central coordinate position with a direction) of the specific portion of the work

searched by the collative model, but does not disclose that the robot moves a second image

capture device to have the determined orientation and/or position. Maeno discloses that said

robot situates said second image data capturing device to have said determined orientation or to

have said determined orientation and said determined position with respect to the object, so that

the second image data capturing device is directed to a characterizing portion of the object; and

wherein said processor detects the position and/or posture of the object based on the position of

said characterizing portion obtained by said second image data capturing device (see discussion

of claims 6 and 17 above).

27.   Regarding claims 11 and 22, Iida discloses that said robot operation is an operation of

picking up at least one object from a plurality of objects overlapped with each other (column 3,

line 44-55).

28.   Claims 8, 19, 27, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Iida in view of Fallon in view of Maeno as applied to claims 6, 7, 17, and 18 above, and further

in view of Soderberg (USPN 4,785,528, newly cited).

29.   Regarding claims 8, 19, 27, and 30, Maeno does not disclose that said first image data

capturing device is used as said second image data capturing device. Soderberg discloses a

robotic work positioning system including a camera 34 mounted on member 28 of robot 10

which serves as both the first and second image data capturing device since it both determines

the position of the work, and is moved to have the determined orientation and/or position (Figure

1; column 2, line 53-column 3, line 1, line 44-50; column 5, line 34-41). It would have been

obvious to one of ordinary skill in the art at the time the invention was made to use said first

image data capturing device as said second image data capturing device as taught by Soderberg

in order to retrieve parts from a conveyor using a vision system to select the desired part from

other parts and engage the part at precisely the correct location to be properly placed by the robot (column 5, line 60-column 6, line 6).

30.   Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iida in view of Fallon as applied to claim 23 above, and further in view of Soderberg.

31.   Regarding claim 26, Iida does not disclose that a second imaging device is affixed to the arm (of the robot; see above 35 U.S.C. 112, 2nd paragraph rejection). Soderberg discloses a camera 34 mounted on member 28 of robot 10 and is used to determine additional arrangement information used to determine the known arrangement of the robot relative to the workpiece (Figure 1; column 3, line 44-50; column 5, line 34-41). It would have been obvious to one of ordinary skill in the art at the time the invention was made to affix an imaging device to the arm of a robot as taught by Soderberg in order to retrieve parts from a conveyor using a vision system to select the desired part from other parts and engage the part at precisely the correct location to be properly placed by the robot (column 5, line 60-column 6, line 6).

32.   Claims 9, 10, 20, 21, 28, 29, 31, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iida in view of Fallon in view of Maeno as applied to claims 6, 7, 17, and 18 above, and further in view of Sakakibara et al. (JP 07-270137, previously cited, "Sakakibara").

33.   Regarding claims 9, 20, 28, and 31, Maeno does not disclose that said second image capturing device comprises a three dimensional visual sensor of spot-light scanning type. Sakakibara discloses a three dimensional visual sensor usable in robot automation (page 1, paragraph 1), of spot-light scanning type capable of measuring distance between the sensor and an object (page 3, paragraph 15). It would have been obvious to one of ordinary skill in the art at

the time the invention was made to utilize a three dimensional visual sensor of spot-light

scanning type as taught by Sakakibara in order to quickly and accurately determine the three

dimensional position of an object using one device (page 2, paragraph 11).

34.   Regarding claims 10, 21, 29, and 32, Sakakibara discloses an image data capturing device

comprising a structured-light unit for irradiating a structured light on an object and capturing an

image of the object including the irradiated light on the object (page 3, paragraph 16).

Conclusion

35.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.

- USPN 4,462,046 to Spight discloses a machine vision system producing a video

  signal representative of a spatial orientation and position of a viewed object.

- USPN 4,680,802 to Nishida et al. discloses a posture judgment system in image

  processing at the time of the preparation of standard data.

- USPN 4,909,376 to Herndon et al. discloses a robotically controlled component feed

  mechanism visually monitoring part orientation.

- USPN 5,727,132 to Arimatsu et al. discloses a robot controlling method for tracking a

  moving object using a visual sensor.

- USPN 6,349,245 to Finlay discloses a method and apparatus for registration of a

  robot carrying an image acquiring arrangement.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Ryan J Hesseltine whose telephone number is 703-306-4069.

The examiner can normally be reached on Monday - Friday, 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

rjh
March 18, 2004

JINGGE WU
PRIMARY EXAMINER